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# Hypertension and the eye

This factsheet was produced under a collaboration between the UK Vision Strategy, RNIB, and the Royal College of General Practitioners.

## Key learning points

- Hypertensive retinopathy is a clinical diagnosis made when characteristic fundus findings are seen in a patient with or who has had systemic arterial hypertension.
- Mild hypertensive retinal features are seen commonly and are of limited relevance, advanced changes represent important signs of accelerated hypertension.
- The main complications from hypertension are retinal artery and retinal vein occlusions, and these cause considerable visual morbidity.
- Treatment of hypertension may resolve ocular features, but does not improve established vision loss.
- Other vascular risk factors eg hyperglycaemia, dyslipidaemia, smoking and abnormal circulation compound the risk and effect of hypertension in the eye.

## Evidence base: common eye diseases are commoner if the patient is hypertensive

- Cataract: In a meta-analysis of 25 studies across the world, risk of cataract was found to be increased in populations with hypertension independent of glycaemic risk, obesity or lipids [1]. We don't know how generalisable this finding is.
- Glaucoma: Nocturnal hypotension is also found to be associated with progression of visual field defects in glaucoma.
- Late stage AMD: Some population studies show increased incidence with high



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systolic BP [2], others show incidence associated with the metabolic syndrome but not specifically with hypertension [3].

- Other: Incidental retinal detachment in non-myopic eyes has been found to be more common [4] but again we don't know how generalisable this is.

## Anatomy and pathophysiology: Inside an eye there are very few blood vessels

Blood vessels are not transparent.

- Front: Blood vessels supply the conjunctiva, episclera, sclera and outer edge of the cornea. Hypertension may cause subconjunctival haemorrhage.
- Middle: The anterior ciliary vessels enter and leave the peripheral iris root behind the lens (supplying the ciliary body which produces aqueous humour providing nutrition to the inner eye). No specific pathological effects of hypertension have been described here.
- Back: The posterior wall has two circulations supplying the retina.
  - a). Outer choroidal blood supply for photoreceptors and optic nerve. Hypertension causes choroidal vascular occlusion and leakage described.
  - b). Inner retinal blood supply to retinal nerve fibres and directly visible within the eye. This may be damaged by hypertension causing a (branch or central) retinal vein occlusion or a (branch or central) retinal artery occlusion.

## Hypertensive retinopathy

- Originally classified into 4 stages (1939) into arteriolar narrowing, arterio-venous nicking, exudation and cotton wool spots, and optic nerve oedema.
- But population studies show that features correlate poorly with severity of hypertension, and may be seen in individuals without hypertension, occurring in up to 10% of adults [5].
- It is not thought routine fundoscopy is helpful in managing hypertension [6].
- Furthermore stages are not necessarily sequential, eg patients with acutely raised



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BP may have retinal haemorrhage (exudative stage) without arteriovenous nicking (sclerotic stage).

- Computer assisted analysis of digital images link arterial hypertension to retinal arteriolar calibre. Early findings indicate there may be prognostic value in monitoring retinal artery diameter [7].
- Severe acute hypertension (accelerated or 'malignant') has disc swelling, nerve fibre layer infarcts (cotton wool spots) and lipid leakage from perifoveal capillaries (macular exudate star).

## Hypertension-related eye disease: symptoms and related findings

- Hypertensive retinopathy may present with intermittent blurring, field defect, headache and a red face, indicating acute onset high blood pressure termed accelerated or malignant hypertension. The high fluctuating blood pressure causes spasm of retinal arterioles and leaking from capillaries around optic disc and macula. Retinal haemorrhages, exudation and disc swelling are the cardinal features. Sudden painless loss of vision may be the result of hypertension-related vascular occlusion within the retinal or choroidal circulations:
  - Retinal vein occlusion is the commonest retinal vascular disease after diabetic retinopathy with a prevalence of 5 per 1000 individuals and 10 year incidence of 16 per 1000 subjects (45-65 years). Macular oedema occurs in 30% of cases. A presenting relative afferent pupillary defect indicates a poor prognosis.
  - Retinal artery vascular occlusion with sudden painless complete vision loss if central, or altitudinal field loss if affecting upper or lower retinal artery circulations.
  - Ischaemia affecting the optic nerve head: anterior ischaemic optic neuropathy initially causes swelling, later atrophy of the optic disc. There may be some recovery of vision but usually an altitudinal field defect remains. Bilateral is unusual (occurs in 20%).



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- Retinal macroaneurysm arising from the retinal arteries, may cause macular exudate and oedema and infarct spontaneously.
- Choroidal capillary infarction –called Elschnig’s spots - may lead to focal areas of outer retinal atrophy.
- Macular serous detachment has been described in pre-eclampsia, presenting with blurred vision associated with retinal and choroidal arteriolar vasospasm.
- Painful loss of vision may indicate high IOP and the development of rubeotic complications of retinal vein occlusion (classically within 6 weeks). New blood vessels grow across iris and angle obstructing aqueous outflow. The high pressures will blind the eye if not treated quickly. Spontaneous sub-conjunctival haemorrhage is more common in hypertension where it affects the inferior nasal and temporal quadrants equally.
- Isolated oculo-motor nerve palsy is unusual feature of hypertension. It accounts for approximately 30% of acquired diplopia (sixth nerve most commonly) and usually resolves spontaneously within 3 months. Third nerve palsy should be investigated for other causes [8].

## Effect of hypertension on pre-existing eye disease

- Diabetic retinopathy: Hypertension increases the risk and progression of diabetic retinopathy and adequate control of BP reduces vision loss from DR [9].

## GP management of chronic hypertensive retinopathy and preventing further problems

- Mild hypertensive retinal features are seen commonly and of limited relevance.
- Chronic hypertensive retinopathy does not require onward referral to an eye unit.
- Investigation of underlying systemic condition and treatment if required.



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## GP management of acute episode and preventing further problems

- Hypertensive retinopathy needs treatment of blood pressure. In case of accelerated hypertension complete resolution of retinal features may occur over a 6-12 month period.
- Nocturnal hypotension is found to be associated with progression of visual field defects in glaucoma and it is recommended that aggressive lowering of BP is avoided in those with glaucoma [10].
- Prevention: Modify lifestyle factors such as smoking, exercise, drugs (eg cocaine causes acute high BP).
- Retinal venous occlusion: 60% of patients are found to have hypertension. 25% will also have diabetes, abnormal lipids and investigation of possible modifiable risk is recommended. Although the role of hypercoagulability is controversial, homocysteine and anticardiolipin antibodies could be tested [11].
- Recent (<12 hours old) central retinal artery occlusion should be referred within 24 hours to an ophthalmologist.
- Central retinal vein occlusion with raised intraocular pressure should be referred to an ophthalmologist within days.
- Other: Anterior ischemic optic neuropathy - it is important to consider migraine in young people and exclude giant cell arteritis in the elderly.
- Recurrent subconjunctival haemorrhage - BP should be checked.

## Eye Unit management of acute episode and preventing further problems

- Full ocular assessment to look for risk factors, raised IOP, abnormal blood vessels on iris or drainage angle (rubeosis) and signs of other eye disease.
- Tests may include a scan called ocular coherence tomography, and retinal circulation imaging with fluorescein angiography.



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- Macular oedema caused by retinal vein occlusion will usually be treated initially with intravitreal anti-vascular endothelial growth factor injections. Approximately 40% have significant improvement of vision.
- Retinal laser photocoagulation therapy may also be indicated to stabilise maculopathy or for neovascularisation (which occurs in 20%). Prognosis for improvement in vision depends on stage of the disease on referral and whether macular function can be restored.
- Occlusion of circulation to optic disc or retinal arteries has a poorer prognosis and although clot busters have been tried, therapy is directed towards prevention of further occlusion and excluding inflammatory causes (eg giant cell arteritis where temporal artery biopsy may be indicated).

## Useful resources

- Ophthalmologic Manifestations of hypertension available at <http://emedicine.medscape.com/article/1201779-overview>
- Hypertension and the eye: changing perspectives. Chatterjee S et al. Journal of Human Hypertension 2002 16:667-675
- NICE guidelines for treatment of central retinal vein occlusion 2014. <https://www.nice.org.uk/guidance/ta305>
- NICE guidelines for visual impairment caused by macular oedema secondary vein occlusion 2013 <https://www.nice.org.uk/guidance/ta283>

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